Early ACL Reconstruction in Combined ACL–MCL Injuries

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ABSTRACT: This study reports 18 patients with 19 combined ligament injuries with complete anterior cruciate ligament (ACL) tear and a minimum grade II medial collateral ligament (MCL) tear who underwent early reconstruction of the ACL and nonoperative treatment of the MCL. Inclusion criteria included ACL reconstruction performed within 3 weeks of initial injury, no history of antecedent injury to the ipsilateral knee, and 2-year follow-up data. Associated injuries were noted in 11 patients including 6 isolated lateral meniscal tears, 1 isolated medial meniscal tear, 5 combined meniscal tears, 1 chondral injury, and 1 patellar fracture. Subjective minimum 2-year follow-up yielded a mean Lysholm score of 94.5 and a mean Tegner activity score of 8.4. Serial clinical examinations demonstrated good functional outcomes, range of motion, and strength. No patient experienced ACL graft failure or valgus instability or required subsequent surgery for chondral or meniscal damage. One patient required a second surgery for arthrofibrosis.

Clinical and functional outcomes in this study were good with low motion complication rates. Based on our data, early surgical reconstruction of the ACL and nonoperative treatment of the MCL in combined injuries is acceptable and results in excellent clinical and functional outcomes.

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INTRODUCTION

The optimal management of combined anterior cruciate ligament–medial collateral ligament (ACL-MCL) injuries is controversial. Recent studies have shown good results with operative management of the ACL tear in conjunction with nonoperative management of the MCL tear.[1-9,11,13-15] Individuals who underwent ACL reconstruction and conservative management of the MCL had superior range of motion and quicker strength gains in the short-term compared to those who underwent repair of both ligaments.[15] In addition, long-term results show excellent stability and functional outcome in individuals treated conservatively.[15]

Less clear is whether early ACL reconstruction or late ACL reconstruction offers superior long-term outcomes. Animal studies have revealed that MCL healing is adversely affected by ACL insufficiency.[18] In a canine model, Woo et al[18] studied the effect of concurrent injury to the ACL on injury healing of the MCL. The results from that study showed that healing of the transected MCL was adversely affected by concomitant transection of the ACL. Both varus-valgus rotation and mechanical properties of the healed ligament failed to recover in knees that had combined transection of the ACL and MCL. This finding has prompted early reconstruction of the ACL to restore stability to the medial side of the knee and provide a more favorable environment for MCL healing. This strategy would ideally obviate the need for subsequent surgery on the medial side. These animal study

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results, however, have not been supported by clinical results from some authors who observed better outcomes with late ACL reconstruction compared to early reconstruction.[12]

This article presents our clinical results in the management of combined ACL–MCL injuries with early ACL reconstruction and nonoperative management of the MCL.

MATERIALS AND METHODS

A retrospective study of individuals with combined ACL and MCL injuries who underwent operative treatment of the ACL was performed. Requirements for inclusion were: 1) complete ACL tear with subsequent ligament reconstruction; 2) minimum grade II MCL tear managed nonoperatively; 3) ACL reconstruction performed within 3 weeks of the original injury; 4) no history of antecedent injury to the ipsilateral knee; and 5) 2-year follow-up data. Between 1992 and 1998, 1757 ACL reconstructions were performed. Combined ACL and MCL injuries were seen in 163 of the 1757 ACL reconstructions. Six isolated MCL tears were treated.

Isolated MCL tears were treated nonoperatively with a brace and functional rehabilitation and rarely, if ever, required surgical intervention. Isolated ACL tears were treated surgically in patients with functional instability and patients who wished to return to high-risk activities such as twisting, pivoting, and cutting. Patients with combined ACL–MCL injuries were counseled similarly about at-risk activities and surgery was recommended accordingly.

Eighteen patients (13 women and 5 men) with 19 combined ACL–MCL injuries met the inclusion criteria for this study. The indication for surgery was a complete traumatic ACL tear in an active individual who wanted to return to activities and to have restored knee stability. For the purposes of this study, early ACL reconstruction was operationally defined as 3 weeks. Data for all patients was gathered prospectively.

Average patient age was 35.7 years (range: 18-57) (Table 1). Eleven left knees and 8 right knees were injured. Average time from injury to surgery was 7.5 days (range: 0-20 days), and average follow-up was 45.6 months (range: 24-98 months). One female patient suffered injuries to both knees while skiing, with an approximate 2-year interval between injuries.

All patients had complete ACL tears, which were initially evaluated with routine clinical examinations. All ACL tears were also confirmed at surgery. Seven patients had grade II MCL tears and 12 patients had grade III tears. Grade II tears were defined as those with medial joint line opening 5-10 mm greater than the contralateral knee on application of a valgus stress with the knee flexed at 30°. Grade III collateral injuries had >10 mm of medial joint line opening compared to the uninjured knee. (Grading of the MCL injuries was determined by the surgeon at the initial office assessment.) Data regarding the location of the MCL tear were available for 12 patients—5 proximal, 3 mid-substance, and 4 distal.

TABLE 1
STUDY DEMOGRAPHICS

Demographic	
No. patients	18
No. knees injured	19
Mean age (range) (y)	35.7 (18-57)
Sex	
Female	13
Male	5
Knee injured	
Left	11
Right	8
Mean time from injury to surgery (days)	7.5
Severity of ACL tears*	
Severity of MCL tears (n)	
Grade II	7
Grade III	12
Surgical Approach (n)	
Bone-patellar-bone graft (arthroscopically assisted)	11
Hamstring autograft (arthroscopically assisted)	5
Arthroscopic hamstring reconstruction	3

**All complete tears.*

Unless associated injuries were present, such as a locked meniscus, which inhibited full motion, all surgical candidates had to meet certain preoperative prerequisites including: 1) ability to obtain full extension; 2) ability to flex to at least 120°; 3) good quadriceps control, as measured by the ability to perform a straight leg raise; and 4) near-normal appearance of the knee. Patients who did not initially meet these prerequisites were placed in a supervised preoperative rehabilitation program until they reached these goals.

Three surgical techniques were used for ACL reconstruction. The type of ACL reconstruction was based on surgeon preference. Eleven patients underwent autogenous bone-patellar tendon-bone grafts with a two-incision, arthroscopically assisted technique. Five patients underwent a two-incision, arthroscopically assisted approach with a hamstring autograft. The remaining three patients had an arthroscopically assisted, hamstring autograft reconstruction.

Postoperative rehabilitation consisted of full passive and active range of motion for the first 6 weeks. Emphasis was placed on patellar and extensor mechanism mobility to prevent stiffness and scarring. Early quadriceps activity and weight bearing were encouraged. A knee brace was

TABLE 2
MEAN FUNCTIONAL OUTCOME AND SUBJECTIVE FOLLOW-UP AT MINIMUM 2-YEARS

	Score
Lysholm	94.5
Tegner Activity	8.4

used to protect from valgus loading. At 6 weeks, postoperative braces were exchanged for sport-type hinged braces. More intensive rehabilitation, including strengthening exercises and proprioceptive training, was introduced at 6 weeks and carried out until quadriceps strength normalized, at which point sport-specific activities were allowed.

Patients were followed with serial clinical examinations. Subjective outcomes measures consisted of Lysholm functional knee scores and Tegner activity scales. In addition, subsequent procedures and complications were recorded.

RESULTS

Examination Under Anesthesia

Examination under anesthesia data was available for 16 patients. Of the patients examined, all had positive Lachman tests, 92% had positive anterior drawer tests, and 94% had positive pivot-shift tests. When comparing knee joint flexion of the injured knee to the uninjured knee, eight patients had loss of flexion $>10\%$ but none had $<90°$ of flexion preoperatively. Knee extension discrepancies $>2°$ in five patients were due to associated meniscal tears in four patients and a patella fracture with effusion in one patient.

Clinical Outcomes

KT-100 arthrometer data was available for 12 patients preoperatively. The mean side-to-side difference was 6.4-mm. KT-1000 data were available for 13 patients postoperatively at a mean of 15 months. The mean side-to-side difference was 2.3 mm. Clinical examinations revealed no valgus instability or rotational instability (pivot shift) in any patient at postoperative follow-up.

Functional Outcomes

Subjective follow-up was obtained from all patients an average 45 months postoperatively. The mean Lysholm score was 94.5, and the mean Tegner score was 8.4. With the numbers available, no statistical difference was noted between the Lysholm or Tegner scores in patients who had grade II MCL tears versus patients with grade III tears. These scores were 94.3 and 8.3 for the grade II MCL tears and 94.6 and 8.4 for the grade III tears.

Associated Pathology

Of the 19 combined ACL–MCL injuries, 14 associated injuries were noted and included 6 isolated lateral meniscal tears, 1 isolated medial meniscal tear, 5 combined meniscal tears, and 1 chondral injury. In 1 patient who underwent an autogenous bone-patellar-bone graft, a medial patellar facet fracture was identified at patellar bone plug harvest. It was nondisplaced and did not communicate with the articular surface of the patella. The fracture was fixed with a cannulated screw.

Surgical Treatment

Three surgical approaches were used for ACL reconstruction: an arthroscopically-assisted two-incision autogenous bone-patellar-bone graft (n=11), an arthroscopically-assisted two-incision autogenous hamstring graft (n=5), and an arthroscopic hamstring autograft reconstruction (n=3). The Lysholm scores for the patients undergoing these three surgical approaches were 92, 98, and 97, respectively. The Tegner activity scores were 8, 9.2, and 8.3, respectively.

Complications and Subsequent Procedures

No patient required subsequent arthroscopy for secondary chondral or meniscal damage. No patient experienced ACL graft failure. One patient underwent rearthroscopy for limited range of motion 6 months after initial reconstruction. This patient had had a hamstring autograft reconstruction. At surgery, arthrofibrosis and a cyclops lesion were identified. No specific contributing factors were identified. The patient underwent arthroscopic debridement and lysis of adhesions and subsequently regained motion and function. The final Lysholm and Tegner scores in this patient were 97 and 10, respectively.

DISCUSSION

Two controversial issues regarding the management of combined ACL–MCL injuries have been addressed in the literature. The first issue pertains to the various surgical options that are available for managing these injuries. Three principal surgical approaches exist with each approach having its proponents. Some authors recommend surgical repair of both ligaments, others recommend ACL reconstruction and nonoperative MCL management, and recently, good results have been observed with operative MCL repair and nonoperative ACL treatment.[6,7,10] The most popular option is ACL reconstruction with nonoperative MCL management. The rationale for this approach is that the ACL is needed for knee stability

and does not have a good potential for primary healing. An added benefit of ACL reconstruction may be the improved stability, which facilitates MCL healing and prevents valgus instability. This notion has been studied and supported by Hillard-Sembell et al,[8] Jokl et al,[9] and Noyes and Barber-Westin.[11]

The second controversial issue regarding combined ACL–MCL injuries is whether early ACL reconstruction or late ACL reconstruction provides optimal return of function and long-term results. Animal studies have revealed that MCL healing is adversely affected by ACL insufficiency.[18] It has, therefore, been proposed that early ACL reconstruction will stabilize the medial compartment and foster MCL healing. The timing of ACL reconstruction in combined ACL–MCL injuries was studied by Petersen and Laprell.[12] Their clinical results showed lower rates of motion loss and re-arthroscopy and better Lysholm scores with late reconstruction (minimum of 10 weeks from initial injury) when compared to early reconstruction (within 3 weeks of initial injury).

For the purposes of this study, 3 weeks was chosen as our definition for early reconstruction and only those who underwent ACL reconstruction within that time frame were included. Although 3 weeks may be viewed as an arbitrary timepoint, for the purposes of our study we identified enough patients to comprise a sufficient sample size to draw reasonable conclusions. Furthermore, we did not want to bias our results towards a treatment approach that favors early bracing and late (>6 week) ACL reconstruction.

The present study shows that early ACL reconstruction and nonoperative MCL treatment for the management of combined ACL–MCL injuries leads to good results with excellent restoration of stability and function. Serial clinical examinations performed postoperatively revealed excellent range of motion with minimal anterior displacement and valgus instability. The mean Lysholm and Tegner scores were 94.5 and 8.5, respectively. These results are superior to those observed by Petersen and Laprell[12] in either their early reconstruction or late reconstruction patient groups. In addition, the Lysholm scores observed in our population are comparable to those seen by Webb et al[17] with isolated ACL reconstructions. In their study population, mean Lysholm score 24 months postoperatively was 93. The MCL tear grade, whether type II or III, made no statistical difference with respect to long-term outcomes. This finding supports the notion that the crucial factor in MCL healing is stabilization of the medial side of the knee, which is fostered by appropriate bracing and early reconstruction of the injured ACL.

No patient in our series underwent subsequent arthroscopy secondary to meniscal or chondral injuries. These findings illustrate that ACL reconstruction can, at least in the short-term, protect the knee from future injury and correct the underlying ligamentous defects. Furthermore, no ACL graft failed. This was an important finding because early reconstruction could conceivably place more stress on the ACL graft while the injured MCL is healing, consequently predisposing the ACL to failure. Finally, no patient had subsequent valgus instability either subjectively or objectively, confirming the ability of the MCL to heal and restore stability.

In the present series, only 1 of 19 knees required further surgery. This individual underwent arthroscopic debridement and lysis of adhesions for arthrofibrosis and an ACL nodule. No specific contributing factors were noted in this specific case. The overall incidence of motion problems was 1 of 19. This is an important finding because of concerns that early surgery might predispose to arthrofibrosis and motion problems. We believe our preoperative protocol, which involves re-establishing motion, quadriceps control, and appearance, may exclude patients who are at risk for stiffness and motion problems.[16] The rate of subsequent surgery in our population, 5.2%, was lower than that reported in the study by Petersen and Laprell,[12] in which approximately 15% of patients undergoing early ACL reconstruction required subsequent surgery for arthrofibrosis or cyclops lesions. The functional outcomes of patients from this series who underwent early ACL reconstruction for combined ACL–MCL injury are also superior to those published by Peterson and Laprell.[12]

CONCLUSION

Managing combined ACL–MCL injuries with early surgical ACL reconstruction and bracing of the MCL offers many theoretical and practical advantages to late surgical reconstruction. The data from this study support this approach. Whether this is better than a delayed approach or late ACL reconstruction is unclear and requires further investigation.

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